Module B – Project TORUS

TOwards Regionally focUsed modelling of decadal climate predictionS

TORUS – Key Question

How will decadal prediction benefit from an improved simulation of the Arctic with a coupled A-O-I system (based on unstructured grids) with strong regional adaptation to process scales?

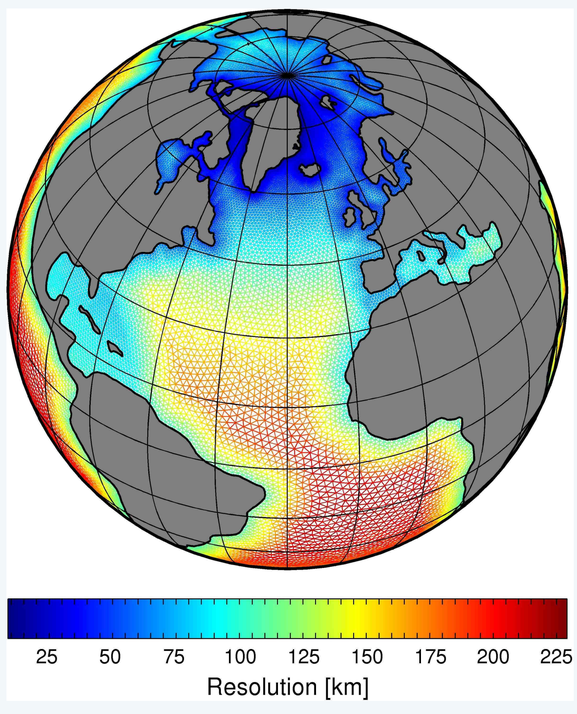
→ Improvement of the simulation of the Arctic by regionally focused modeling within a coupled global model system.

Current Status

- Coupling of ECHAM6 and FESOM using OASIS3-MCT technically completed (started in May 2012, finished in Dec. 2012)
- Validation of the coupled model system with different setups (since Dec. 2012).

The coupled model system ECHAM6-FESOM

FESOM (~ 50,000 2D nodes)



ECHAM6 T63/L47

OASIS3-MCT

A global model with varying resolution
(different meshes with different resolution are currently tested)

MiKlip resolution and configuration
(adjustment of the land-sea mask for minimizing flux imbalances)

Model Validation

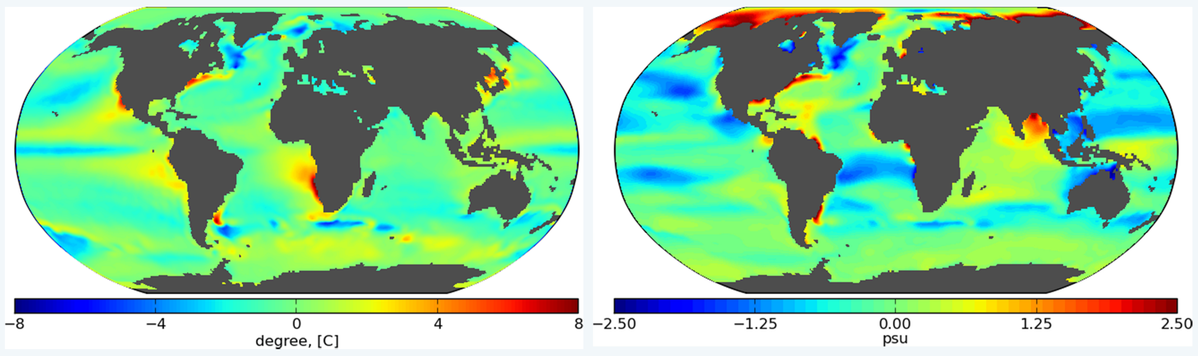


Fig. 1: Difference of simulated SST (left) and SSS (right) to the WOA05 climatology, indicating a northward shift of the Gulf Stream and a negative SST bias in the Labrador Sea in the model.

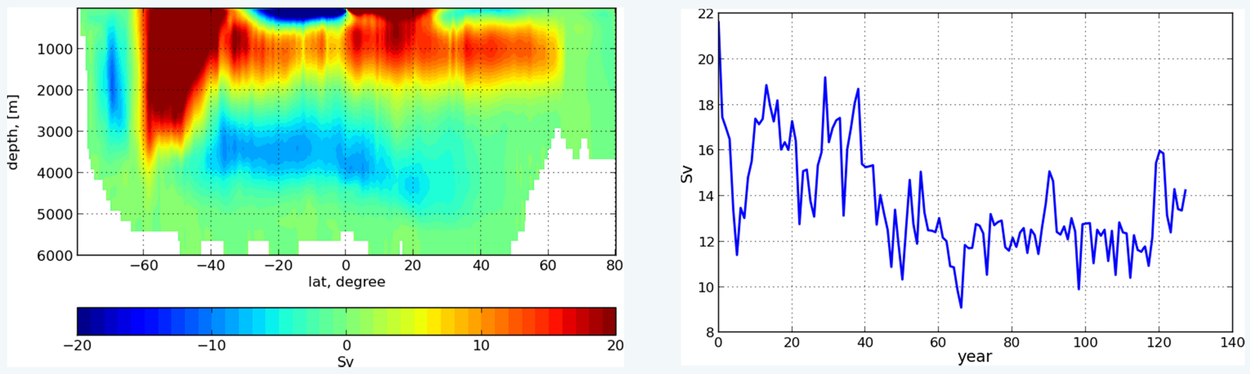


Fig. 2: Simulated Meridional Overturning Circulation (MOC; left) and time series of the maximum Atlantic MOC at 45ºN (right).

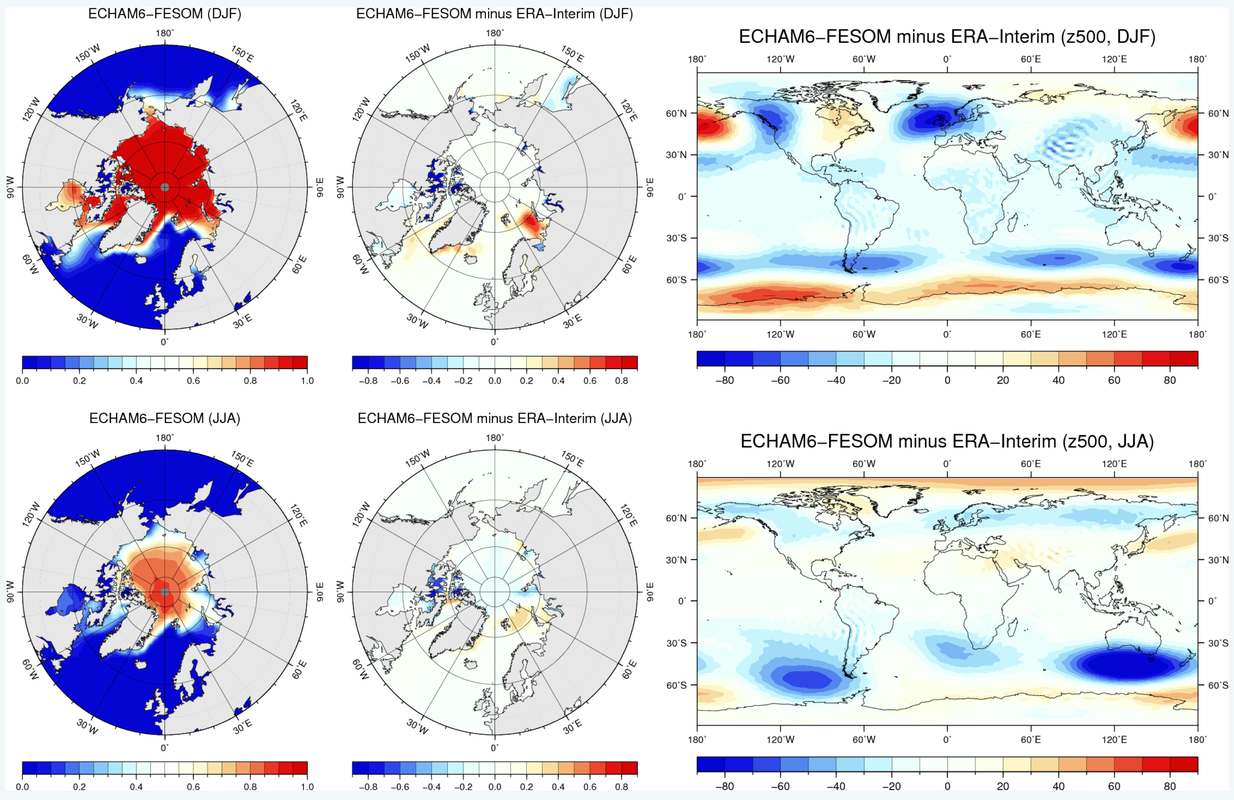


Fig. 3: Simulated Arctic sea-ice concentration (left) and differences of sea-ice concentration (middle) and geopotential height at 500 hPa (right) to ERA-Interim data in winter (DJF; top) and summer (JJA; bottom). The overestimate of winter sea ice in the Labrador Sea corresponds to the weakening of the AMOC after about 40 years. The geopotential heights indicate biases in the planetary wave patterns.

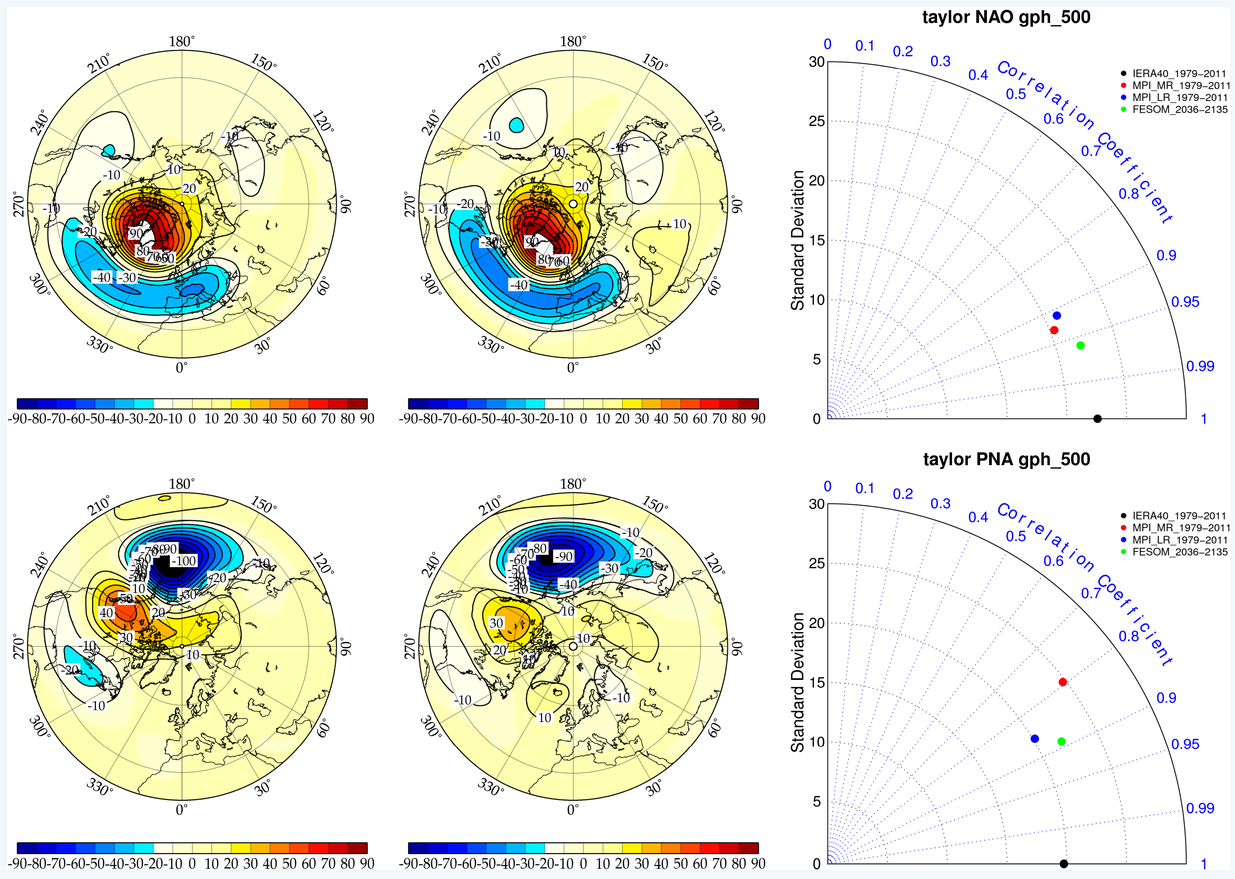


Fig. 4: NAO (top) and PNA pattern (bottom) from rotated EOF analysis of 500-hPa geopotential heights in the model (left) and in ERA-Interim data (middle) and the corresponding Taylor diagram (right). The temporal and spatial characteristics of such teleconnections might play a key role for decadal predictions.

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